**Discussion Draft**

Background Information & DEQ Recommendation:

Revising Oregon’s Human Health Criterion for Iron

**Oregon’s Current “Human Health” Criterion for Iron**

Oregon’s current water quality criteria for iron are 300 µg/l (0.3 mg/l) for “human health” and 1000 µg/l (1.0 mg/l) for freshwater aquatic life (chronic criterion). These were EPA’s national recommended criteria at the time they were adopted. DEQ has interpreted and specified in our 2004 criteria, that the iron and manganese criteria are for dissolved metals rather than total recoverable.

**Review of Oregon’s “Human Health” Criterion for Iron**

As part of the Oregon Toxics Standards Review project, DEQ is reviewing Oregon’s human health criterion of 300 µg/l for iron. DEQ agreed to review this criterion because iron is a naturally occurring earth metal that sometimes exceeds the criterion and because the criterion is not based on levels needed to protect human health.

**Federal Criteria Requirements and Recommendations**

Iron is a “non-priority” pollutant under the CWA. Federal regulations for non-priority pollutants (40 CFR § 131.11), require that states adopt criteria based on a sound scientific rationale that covers sufficient parameters to protect designated uses. Both numeric and narrative criteria may be applied to meet these requirements.[[1]](#footnote-2)

EPA’s 1976 and 1986 *Quality Criteria for Water* (referred to as the “Red Book” and “Gold Book,” respectively) established 300 µg/l as the recommended water quality criterion for iron for protection of domestic water supplies.[[2]](#footnote-3),[[3]](#footnote-4) EPA does not specify whether this criterion is for dissolved or total recoverable iron. According to the Red Book, “the iron criterion in water is to prevent objectionable tastes or laundry staining (0.3 mg/l) [and] constitutes only a small fraction of the iron normally consumed and is of aesthetic rather than toxicological significance” (text in brackets added). EPA’s recommendation for iron in *Water Quality Criteria 1972* (EPA, 1973) specified that 0.3 mg/l soluble iron not be exceeded in public water supply sources.

EPA’s iron criterion under the Clean Water Act is the same as the secondary maximum contaminant level (MCL) established in EPA’s National Secondary Drinking Water Regulations under the Safe Drinking Water Act. Secondary MCLs are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color and odor. These contaminants are not considered to present a risk to human health at the secondary MCL.[[4]](#footnote-5)

**Effects of Iron related to Public Water Supply**

Taste: There is a range of sensitivities to the taste of iron in drinking water that can vary based on the form of iron. A 1960 study referenced by EPA’s “Red Book” (1976) indicated that the taste of iron may be detected readily at levels of 1800 µg/l in spring water and 3400 µg/l in distilled water.

Health: The “Red Book” also noted that the daily nutritional requirement for iron is 1000 to 2000 µg/l, but that much larger amounts of iron must be ingested due to poor absorption. Tolerable upper intake levels used for a recent revision to West Virginia’s criterion were 45,000 µg/l for adults and 40,000 µg/l for children (see below).

**Recent Actions in other States**

As part of this review, information concerning iron criteria revisions that have been conducted in other states is being considered. Information gathered to date is summarized below.

***West Virginia***

In 2003, the State of West Virginia adopted an iron criterion of 1500 µg/l for the protection of both aquatic life and human health uses. Support for EPA approval included the following:

* EPA Region 3 had previously approved a 1500 µg/l iron criterion for Pennsylvania, citing scientific studies demonstrating than an aquatic life criterion of 1500 µg/l for total iron is sufficiently protective of both instream and withdrawal uses of Pennsylvania’s waters.
* EPA Region 8 has approved various site-specific iron criteria greater than 1000 µg/l based on scientific site-specific studies in Colorado.
* EPA’s national recommended water quality criterion for iron of 300 µg/l is based on national secondary drinking water standards, which are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color and odor based on taste and odor.
* Tolerable Upper Intake Levels (UL) of iron for adults is 45 mg (45,000 µg) per day and for children is 40 mg (40,000 µg) per day. Maximum average intake from food and supplements is about 18 mg (18,000 µg) per day.
* Human health iron toxicity studies indicate that 1500 µg/l is protective of the majority of the population.

***Missouri***

In 2006, the State of Missouri removed its drinking water criterion of 300 µg/l for iron. Support for EPA approval included the following:

* EPA’s recommended criterion for iron of 300 µg/l is based on aesthetic (e.g., laundry staining) and organoleptic (i.e. taste) effects and as such, was not developed to protect against toxicological effects.
* EPA reviewed data provided by the Missouri Department of Natural Resources regarding the State’s 2002 and draft 2004 lists of impaired waters. Based upon this information, EPA did not have reason to expect levels of iron to be present that would interfere with the protection of waters designated for Drinking Water Supply.
* The manner in which Missouri assigns designated uses to the state’s waters results in any water designated for Drinking Water Supply to also be designated for Warm Water Aquatic Life and Human Health-Fish Consumption. Given this method, the chronic aquatic life criterion for iron of 1000 µg/l, expressed as dissolved iron, is effective for all waters designated as Drinking Water Supplies.
* EPA also reviewed available information regarding potential human health effects from iron and analyzed this information, in combination with water quality monitoring data from waters in Missouri designated as Drinking Water Supply, in order to estimate potential exposure to iron. The results of this analysis led EPA to determine that the absence of an iron criterion for drinking water would not result in significant increased exposure to iron, and that a separate criterion for iron is not necessary to protect Missouri’s Drinking Water Supply Use.

**DEQ Recommendation**

Potential options for revising Oregon’s human health criterion include:

1. Revise the 300 µg/l iron criterion to protect human health.
2. Withdraw the 300 µg/l iron criterion for human health and adopt a criterion for public and private water supply use based on organoleptic effects.
3. Withdraw the 300 µg/l iron criterion for human health and rely on the aquatic life criterion of 1000 µg/l iron to protect public water supply.

DEQ recommends withdrawing our criterion for human health and relying on the aquatic life criterion of 1000 µg/l dissolved iron for the following reasons:

* The current criterion of 300 µg/l is not based on human health effects.
* Iron criteria for the protection of human health are not necessary. The tolerable intake levels are higher than those found in Oregon surface waters and much higher than the aquatic life criterion of 1000 µg/l.
* Aquatic life is a designated use in all surface waters for which public or private water supply is a designated beneficial use and therefore the aquatic life criterion would apply in those waters.
* The aquatic life criterion is sufficient to protect against organoleptic effects in domestic water supplies and, therefore, a statewide criterion to protect against these impacts is not needed.
* Oregon has a narrative criterion that allows us to protect against objectionable taste and odor.

1. EPA. 1994. *Water Quality Standards Handbook, Second Edition*. U.S. Environmental Protection Agency, Washington, D.C. EPA 823-B-94-005. Page 3-23. Available at: <http://www.epa.gov/waterscience/standards/handbook/>. [↑](#footnote-ref-2)
2. EPA. 1976. *Quality Criteria for Water* (“Red Book”). U.S. Environmental Protection Agency, Office of Water, Washington, D.C. PB-263 943. Available at: <http://www.epa.gov/waterscience/criteria/library/redbook.pdf>. [↑](#footnote-ref-3)
3. EPA. 1986. *Quality Criteria for Water* (“Gold Book”). U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA 440/5-86-001. Available at: <http://www.epa.gov/waterscience/criteria/library/goldbook.pdf>. [↑](#footnote-ref-4)
4. EPA. 1992. *Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals*. U.S. Environmental Protection Agency, Washington, D.C. EPA 810/K-92-001. Available at: <http://www.epa.gov/safewater/consumer/2ndstandards.html>. [↑](#footnote-ref-5)